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Siemens Corporation
Intellectual Property Department
170 Wood Avenue South
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| EXAMINER |
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KHOLDEBARIN, IMAN K

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| ART UNIT | PAPER NUMBER |
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3737

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06/27/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/696,608

Applicant(s)

CHOMAS ET AL.

Examiner

I Kenneth Kholdebarin

Art Unit

3737

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15, 23 and 24 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-15, 23 and 24 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 10/29/2003.

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Sumanaweera (US 5,967,987).

Sumanaweera teaches a method of tracking motion using an ultrasound with transducer within a region. Sumanaweera teaches the acoustic waveforms are reflected off of structures within a body, including moving fluid within an enclosed structure, as echoes. The echoes are detected by the transducer 102. ()

Sumanaweera teaches: once the user orients the transducer 30, the user initiates the acquisition of these various measurements. The user may use a color velocity or an energy image to position the scan plane at an angle associated with non-zero velocity or energy estimates to improve volume flow accuracy (See col.5, line 62-68).

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3. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Darrow (US 5,255,680).

Darrow teaches where scanplane is altered responsive to detected instrument movement.

Darrow furthermore teaches When the position of invasive device 120 begins to move outside of the field of view of medical imaging device 103, tracking computer causes positioning means 70 to alter the position and orientation of support arm 101 in relation to support table 110. (Col. 7, line 26-47).

Re Claim 2: Sumanaweera discloses based on the transmission and reception of ultrasound beams, blood flow parameters, such as Doppler velocity values associated with the intersection 36, are estimated. A variety of techniques may be used to calculate the average velocities $u_{sub.1}$ and $u_{sub.2}$ from the blood flow parameters. These techniques include autocorrelation estimation, fast-Fourier transform or cross correlation algorithms. Preferably, a pixel or range cell counting technique or a uniform insonification technique is used, (See Col.6, line 28-35).

Re Claim 3: Sumanaweera discloses that for real-time volume flow, the orientation of the tubular structure is determined using the second area and the first and second blood flow parameters. As measurements are made, the orientation information is used to derive the real-time volume flow.

Re Claim 5: Sumanaweera teaches the method is performed by ultrasound energy and the acquisition scan plane position at the region of interest through out the study, (See Fig. 1 and 3)

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A method for measuring flow of fluid in an enclosed structure with an ultrasound system, the method comprising the steps of: obtaining for each of at least two scan planes at least first and second blood flow parameters representing a substantially same spatial location and associated with first and second scan line directions, respectively and that the user input determine the first area, (See Claim 32-33).

Re Claim 6: Sumanaweera disclosed the limitation of claim 6 (See above) and further teaches that the transducer 102 is any of various transducers, such as a linear, 1.5 or 2 dimensional arrays of piezoelectric elements, (see col.3 line 24-27).

Re Claim 7-9: Sumanaweera teaches the scan lines may be at any of various angles relative to the transducer 102 and originate at various locations along the transducer 102. By transmitting a plurality of acoustic waveforms along a respective plurality of scan lines in various formats, such as linear or sector, a scan plane is sequentially insonified, (See col.3, line 30-44).

Re Claim 13: Sumanaweera teaches about the velocity of the blood fluid within the structure by ultrasound apparatus, (Col. 1, line 19-23)

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sumanaweera (US 5,967,987).

Re Claim 4: Although Sumanaweera does not teach the rotation of the scan plane but Sumanaweera teaches measurements are obtained for two or more scan planes 34. The transducer 30 is moved so that the scan plane 34 intersects the enclosed structure 32 at a different orientation. For example, the transducer 30 is rotated, translated or slid to a second position such that the same general region of the enclosed structure is interrogated at a different orientation. Therefore it would have been obvious to one ordinary skill in the art at the time of the invention was made that it is necessary to have an intersection between the scan planes and the structure 32. This could be accomplished by rotating the transducer or the scan plane.

Re Claim 10 and 11: Although Sumanaweera does not teach the grouped set of beams spaced apart within the three dimensional vol. Sumanaweera teaches the use of transmitting acoustic energy and collected the reflection with transducer and altering the, the transducer 30 is rotated, translated or slid to a second position such that the same general region of the enclosed structure is interrogated at a different orientation. Sumanaweera further process the result of the scan plane position in response to the motion and displays the images responsive to the scanning on display 110. (See Fig. 2 and 3)

Therefore it would have been obvious to one ordinary skill in the art at the time of the invention was made to emit beam(s) individually or in group of beams in order to further collect the

reflected beams by the transducer 30 to have a better understanding of the motion of the 3-D subject within the structure under examination. These received data will further be processed and displayed on the screen.

Re claim 12: Although Sumanaweera does not teach the shifting of the two-dimensional images as function of an initial position of the region Sumanaweera teaches the estimates, such as Doppler velocity, and/or any B-mode information representing the scan plane, are provided to the scan converter 108. The scan converter 108 is a processor for formatting the estimates into a Cartesian coordinate system for display (Col.3, line 54-58).

Therefore it would have been obvious that a converter 108 could perform the shifting of the two-dimensional images in order to format the data in Cartesian coordinate before being displayed on screen 110.

Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sumanaweera (US 5,967,987) in view of Melton (US 5,373,848).

Re claim 14 and 15: Although Sumanaweera does not teach the tracking of the motion comprises tracking one of speckle and spatial gradient,

Melton teaches according to the invention, in order to determine blood flow independent of direction, the interrogation volume is made substantially spherical. For this case, this means that the volume is symmetric with respect to the spatial gradient along any axis that passes through its center (not just the x-y-z system shown in the figures), (See Col. 5, line 50-55).

Therefore it would have been obvious for one ordinary skill in the art at the time of the invention was made to apply spatial gradient thought by Melton for a symmetric fluid like blood in vessel in order to find the blood flow independent of direction.

Claims 23 and 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sumanaweera (US 5,967,987) in view of Hossack (US 6,083,168).

Re Claim 23 and 24: Although Sumanaweera does not teach the automatically altering an acquisition volume position to be relative to a transducer,

Hossack teaches the method of an ultrasound imaging comprises the steps of measuring motion of a transducer array by measuring motion of a sub-block of pixels between at least two ultrasound-image frames and automatically altering an operating mode of a transducer array in response to an absence of measured motion.

Hossack also teaches the system applies different imaging parameters within and outside a region of interest in an ultrasound image to improve spatial and/or temporal resolution inside a region of interest and motion estimation logic 190 performing an image motion tracking technique can determine frame-to-frame motion of a sub-block of pixels.

Therefore it would have been obvious to one ordinary skill in the art at the time of the invention was made to automatically alter an acquisition volume position as a function of motion to improve the resolution and operation.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to I Kenneth Kholdebarin whose telephone number is 571-270-1347. The examiner can normally be reached on M-F 8 AM- 4 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Casler can be reached on 571-272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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